



# Environment and Natural Resources Trust Fund

M.L. 2020 Approved Work Plan

## General Information

**ID Number:** 2020-025

**Staff Lead:** Michael Varien

**Date this document submitted to LCCMR:** August 13, 2021

**Project Title:** Expanding Restoration And Promoting Awareness Of Native Mussels

**Project Budget:** \$489,000

## Project Manager Information

**Name:** Seth Stapleton

**Organization:** Minnesota Zoological Society

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## Project Reporting

**Date Work Plan Approved by LCCMR:** August 13, 2021

**Reporting Schedule:** April 1 / October 1 of each year.

**Project Completion:** June 30, 2025

**Final Report Due Date:** August 14, 2025

## Legal Information

**Legal Citation:** M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 03f

**Appropriation Language:** \$489,000 the second year is from the trust fund to the Minnesota Zoological Garden to promote mussel conservation by rearing juvenile mussels for reintroduction, researching methods to improve growth and survival in captivity, and encouraging public action to benefit water quality. This appropriation is available until June 30, 2025, by which time the project must be completed and final products delivered.

**Appropriation End Date:** June 30, 2025



## Narrative

**Project Summary:** The Minnesota Zoo will improve mussel conservation by rearing juvenile mussels for reintroduction, researching methods to improve growth and survival in captivity, and encouraging public action to benefit water quality.

**Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.**

To improve the conservation of mussels and promote water quality, the Minnesota Zoo is culturing juvenile mussels produced by the DNR for reintroduction and researching husbandry methods that will best support restoration efforts. Native mussels serve as critical ecosystem engineers, creating habitat for fish and other aquatic wildlife and helping to keep Minnesota's waterways clean by filtering algae, sediment, and pollutants. Today, however, freshwater mussels are the most at-risk group of species in the nation. Minnesota is no exception, as mussel populations in many of our waterways have been significantly depleted.

The Zoo will build upon previous ENRTF investments that have enabled us to increase our capacity for rearing juvenile mussels to >10,000 individuals and supported the construction of a research facility. To date, >1,000 mussels have been returned to the DNR for reintroduction, and research findings from sediment trials have improved rearing success. Launched in 2017, the Show Us Your Mussels Challenge promotes awareness about water resources and encourages public action through student-created digital media campaigns. Students from 30 schools have reached >120,000 members of the public with messages of mussel conservation, and teachers state-wide have been engaged through lesson plans developed by the Zoo.

**What is your proposed solution to the problem or opportunity discussed above? i.e. What are you seeking funding to do? You will be asked to expand on this in Activities and Milestones.**

We propose to use our strengths as a zoo-based conservation organization to expand upon our mussel conservation activities, thereby improving the conservation of mussels in Minnesota. Specifically, we will leverage our unique site, expertise in aquatic systems, and high-quality water resources to continue to rear mussels provided by the DNR and USFWS for eventual reintroduction. We will further develop our on-site capacity to evaluate methods that improve growth and survivorship for new target species. Finally, we will use our educational expertise and high annual visitation – some 1.3 million visitors per year – to further promote public awareness and inspire action through an expanded Show Us Your Mussels Challenge. This proposal specifically addresses the DNR's need for additional space for rearing juvenile mussels, thus supporting long-term restoration goals.

**What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?**

Without targeted conservation action, populations of imperiled, native mussels will be unable to recover and fulfill their key ecological roles. To improve the conservation of our aquatic resources, we will:

- Rear native mussels to support reintroduction efforts led by the DNR and better position the Zoo to complement restorations;
- Advance our understanding of mussel rearing and propagation to maximize growth and survival; and
- Promote awareness and encourage public action on behalf of healthy waterways and aquatic wildlife by expanding our digital media initiative.

## Project Location

**What is the best scale for describing where your work will take place?**

Statewide

**What is the best scale to describe the area impacted by your work?**

Statewide

**When will the work impact occur?**

During the Project and In the Future

## Activities and Milestones

### Activity 1: Rearing native mussels at the Zoo and improving husbandry practices

**Activity Budget:** \$340,770

**Activity Description:**

We will use the Zoo’s increased capacity for rearing juvenile mussels – we can now accommodate more than 10,000 individuals – to continue to benefit mussel restoration by growing mussels provided by the DNR and US Fish and Wildlife Service from small juveniles until they are large enough for reintroduction. To further support the DNR’s activities, we will construct systems to grow newly transformed, microscopic mussels produced at their facility and to hold host fish that are needed for mussels to reproduce. We also will improve quarantine systems for new acquisitions to evaluate protocols for minimizing the potential transfer of disease and zebra mussels to uninfested waters. Using the Zoo’s recently constructed research and rearing lab, we will examine factors that may improve mussel survival and growth in captivity, such as sediment size, flow rates, and supplemental feed, to improve husbandry practices and accelerate the return of mussels to native waterways. This research will build upon studies conducted during 2019 and 2020. Activities will focus on species identified by DNR and USFWS as priorities in the Cedar, Cannon, and Mississippi River watersheds.

**Activity Milestones:**

Description	Completion Date
Construct and optimize juvenile mussel rearing systems, host fish systems, and quarantine systems.	October 31, 2022
Rear juvenile mussels. Up to 1,000 reared to releasable size per species annually.	June 30, 2025
Complete experiments to evaluate rearing methods that maximize growth and survival. Finalize analyses and reports.	June 30, 2025

### Activity 2: Expanding the Show Us Your Mussels digital media challenge and promoting public awareness

**Activity Budget:** \$148,230

**Activity Description:**

The Minnesota Zoo's Show Us your Mussels Challenge will continue to serve both middle and high school students and provide teachers with multiple levels of support for implementation. Students will develop and deliver digital media campaigns — such as online videos, websites, and social media outreach — promoting mussel conservation, water quality, and personal or community action. The focus on digital media allows teachers to engage in the challenge, whether providing instruction in-person, through distance learning or flexing between the two models. We will leverage our educational expertise to engage teachers and students through in-person or virtual Zoo classes, presentations to schools, professional development for teachers, and educational resources updated to reflect current state and national standards. We will strengthen our partnership with local schools and evaluate the impact on knowledge, attitudes, and behaviors of participants and the public.

**Activity Milestones:**

Description	Completion Date
Mussel educational resources updated to meet new state science standards and realities including distance learning.	June 30, 2024
Recruitment of new schools to participate in the SUYM challenge (annual).	December 31, 2024
Professional development, presentations to schools and other support provided to teachers (annual).	April 30, 2025
Top schools visit Zoo to participate in on-site conservation programs or equivalent virtual experience (annual).	June 30, 2025



## Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Mike Davis	Minnesota DNR	Technical expertise and guidance. Provision of juvenile mussels and coordination of release of more fully-grown sub-adult mussels. Project Manager of the DNR's ENRTF-supported mussel conservation project.	No
Bernard Sietman	Minnesota DNR	Technical expertise and guidance, particularly associated with research elements of Activity 1 and identification of priority species. Provision of juvenile mussels and coordination of release of more fully-grown sub-adult mussels.	No
Madeline Pletta	Minnesota DNR	Technical expertise and guidance. Provision of juvenile mussels and coordination of release of more fully-grown sub-adult mussels.	No
Lindsay Ohlman	Minnesota DNR	Technical expertise and guidance. Provision of juvenile mussels and coordination of release of more fully-grown sub-adult mussels.	No
Zeb Secrist	Minnesota DNR	Technical expertise and guidance. Provision of juvenile mussels and implementation of release of more fully-grown sub-adult mussels.	No
Megan Bradley	US Fish and Wildlife Service, Genoa National Fish Hatchery	Technical guidance and expertise. Provision of additional juvenile mussels and coordination of release of more fully-grown sub-adult mussels.	No
Elizabeth Glidewell	US Fish and Wildlife Service, Genoa National Fish Hatchery	Technical guidance and expertise. Provision of additional juvenile mussels and coordination of release of more fully-grown sub-adult mussels.	No

## Dissemination

**Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.**

Updates on activities and progress will be shared with collaborators via regular reports, and information about this work and the conservation of Minnesota's aquatic resources will be disseminated to the general public frequently. These communications may include presentations by Zoo staff to school groups, summer camps and other public venues and sharing information on the Minnesota Zoo's web page, social media outlets, and via correspondence with member households. In addition, select Zoo staff and volunteers will be trained in speaking with the public about mussels, the Zoo's rearing and research program, our partnerships with the DNR and other organizations, and the benefits of mussels for a healthy ecosystem and improved water quality. Results of research evaluating optimal conditions for maximizing mussel growth and survival in captivity will be submitted for publication in peer-reviewed scientific journals and presented at professional conferences.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the ENRTF Acknowledgement Guidelines.

## Long-Term Implementation and Funding

**Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this be funded?**

This proposal is part of a larger, multi-partner effort, including the DNR and USFWS, to restore imperiled mussel

populations across Minnesota and the upper Midwest to historic levels. Given the significant filtration performed by healthy mussel communities, these restoration efforts will help achieve Minnesota’s clean water goals. Public awareness about mussel conservation and actions to improve water quality will be increased by our project. We expect that the mussel rearing activities will need to continue beyond the scope of this proposal; the Zoo will continue to seek other sources of support for this initiative.

### Other ENRTF Appropriations Awarded in the Last Six Years

<b>Name</b>	<b>Appropriation</b>	<b>Amount Awarded</b>
Rearing Native Mussels for Reintroduction and Expanding Water Quality Awareness	M.L. 2017, Chp. 96, Sec. 2, Subd. 04c	\$591,000



## Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
<b>Personnel</b>								
Mussel Conservation Specialist, 1 person at 0.8 FTE for 4 years		Coordination and implementation of Activity 1; assistance with implementation of Activity 2.			36%	3.2	X	\$293,400
Project Manager / Principal Investigator, 1 person at 0.05 FTE for 4 years		Overall coordination of project activities. Research oversight and coordination.			28%	0.2	X	\$27,700
Education Project Coordinator, 1 person at 0.13 FTE for 4 years		Coordination and implementation of Activity 2			20%	0.52	X	\$53,800
Intermittent mussel educator, 1 person at 0.05 FTE for 4 years		Implementation of Activity 2			12%	0.2	X	\$12,100
							<b>Sub Total</b>	<b>\$387,000</b>
<b>Contracts and Services</b>								
TBD	Professional or Technical Service Contract	Contracts with teachers to update school materials and resources associated with mussel conservation to meet new state education standards. 5 teachers x \$500 contracts x 1 summer. Competitive bid process.				0.04		\$2,500
							<b>Sub Total</b>	<b>\$2,500</b>

<b>Equipment, Tools, and Supplies</b>								
	Tools and Supplies	Cartridge filters, drum filter screens, other filters, UV light bulbs, replacement pump parts, fish food, supplemental mussel feed, water quality testing kits and calibration standards, and other supplies for current and new systems. Annual replacements for 4 years.	Maintenance of systems for rearing juvenile mussels and researching husbandry methods.					\$18,500
	Tools and Supplies	Tags, attachment materials, substrate, and other research supplies.	Research supplies to assess rearing conditions that improve growth and maximize survival of mussels. Materials to quantify water quality.					\$2,000
	Tools and Supplies	Materials for construction and optimization of newly transformed juvenile mussel systems and host fish systems; materials for expanding rearing systems in Zoo's A Lake; expansion of quarantine system. Includes pumps, chillers, tanks, pipe, mussel rearing baskets, small dock extension, and other equipment and supplies.	Develop capacity to rear newly transformed juvenile mussels and fish hosts at the Zoo. Improve and expand rearing capacity in Zoo's A Lake and quarantine capacity.					\$29,680
							<b>Sub Total</b>	<b>\$50,180</b>
<b>Capital Expenditures</b>								
							<b>Sub Total</b>	-
<b>Acquisitions and Stewardship</b>								
							<b>Sub Total</b>	-
<b>Travel In Minnesota</b>								
	Miles/ Meals/ Lodging	Fuel / mileage, meals and lodging. Rates as permitted by the State of Minnesota. \$400 / year for 4 years.	Travel to field sites in southern and central Minnesota and conduct site visits with project partners.					\$1,600
	Conference Registration Miles/ Meals/ Lodging	Fuel / mileage, meals, lodging and conference registration fees associated with Activity 2. Rates as permitted by State of Minnesota regulations. \$600 / year for 4 years.	Travel to conferences specifically related to the digital media challenge and / or mussel conservation to engage educators. Conferences may include TIES Education Technology					\$2,400

			Conference, MnSTA Conference on Science Education (MNCOSE), Minnesota Independent School Forum STEM Conference, and Minnesota Educator Academy Conference.					
							<b>Sub Total</b>	<b>\$4,000</b>
<b>Travel Outside Minnesota</b>								
							<b>Sub Total</b>	<b>-</b>
<b>Printing and Publication</b>								
	Printing	Printing of educational resources. \$30 / copy x 100 copies.	Mussel conservation resources for teachers participating in the digital media challenge (Activity 2).					\$3,000
	Printing	Printing of promotional materials (2,000 half pages x \$0.40 / unit and 1,500 full pages x \$0.80 / unit).	Materials promoting the digital media challenge (Activity 2) for distribution at select conferences.					\$2,000
							<b>Sub Total</b>	<b>\$5,000</b>
<b>Other Expenses</b>								
		Promotional post card mailing to educators state-wide. 6,000 post cards x \$0.18 / unit for 4 years.	Recruit teachers to participate in the digital media challenge (Activity 2)					\$4,320
		Busing (transportation) costs. \$1,500 / school x 6 schools / year for 4 years.	Transport students from top participating schools to the Zoo to learn more about the conservation of mussels and aquatic resources.					\$36,000
							<b>Sub Total</b>	<b>\$40,320</b>
							<b>Grand Total</b>	<b>\$489,000</b>

## Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
<p><b>Personnel</b> - Mussel Conservation Specialist, 1 person at 0.8 FTE for 4 years</p>		<p>Coordination and implementation of Activity 1; assistance with implementation of Activity 2.</p>	<p><b>Classified</b> : This staff person has the necessary expertise required to successfully implement Activity 1 and assist with the implementation of Activity 2. ENRTF funding will make it possible for this individual to work on the project for the percentage of time indicated in the budget. Without this funding, they would be unable to support the project with their time. Responsibilities for classified staff will be reprioritized and reallocated as necessary to support the project.</p>
<p><b>Personnel</b> - Project Manager / Principal Investigator, 1 person at 0.05 FTE for 4 years</p>		<p>Overall coordination of project activities. Research oversight and coordination.</p>	<p><b>Classified</b> : This staff person has the necessary expertise required to successfully coordinate project activities and oversee research and scientific elements. ENRTF funding will make it possible for this individual to work on the project for the percentage of time reflected in the budget. Without this funding, they would be unable to support the project with their time. Responsibilities for classified staff will be reprioritized and reallocated as necessary to support the project.</p>
<p><b>Personnel</b> - Education Project Coordinator, 1 person at 0.13 FTE for 4 years</p>		<p>Coordination and implementation of Activity 2</p>	<p><b>Classified</b> : This staff person has the necessary expertise required to successfully coordinate and implement the education elements of the project (Activity 2). ENRTF funding will make it possible for this individual to work on the project for the percentage of time reflected in the budget. Without this funding, they would be unable to support the project with their time. Responsibilities for classified staff will be reprioritized and reallocated as necessary to support the project.</p>
<p><b>Personnel</b> - Intermittent mussel educator, 1 person at 0.05 FTE for 4 years</p>		<p>Implementation of Activity 2</p>	<p><b>Classified</b> : This staff person has the necessary expertise required to successfully implement the education elements of the project (Activity 2). ENRTF funding will make it possible for this individual to work on the project for the percentage of time reflected in the budget. Without this funding, they would be unable to support the project with their time. Responsibilities for classified staff will be reprioritized and reallocated as necessary to support the project.</p>

## Non ENRTF Funds

Category	Specific Source	Use	Status	Amount
<b>State</b>				
Cash	Minnesota Zoo's General Operating Budget	Administrative costs, utilities, and other expenses associated with implementation of activities, estimated at 15% of the total grant	Pending	\$73,350
Cash	Minnesota Zoo's appropriation from State of Minnesota's Clean Water, Land and Legacy amendment or General Operating Budget	Supplemental funds for additional unforeseen project expenses including equipment and supplies, estimated at \$2,500 / year for 4 years	Pending	\$10,000
			<b>State Sub Total</b>	<b>\$83,350</b>
<b>Non-State</b>				
Cash	Minnesota Zoo Foundation	Supplemental funds for additional, unforeseen project expenses including equipment and supplies, estimated at \$2,500 / year for 4 years	Pending	\$10,000
			<b>Non State Sub Total</b>	<b>\$10,000</b>
			<b>Funds Total</b>	<b>\$93,350</b>

## Attachments

### Required Attachments

#### *Visual Component*

File: [4ad5bf80-b0a.pdf](#)

#### *Alternate Text for Visual Component*

We will grow mussels produced by the DNR to a releasable size. We will conduct research to improve husbandry and engage the public via student-created digital campaigns....

### Optional Attachments

#### *Support Letter or Other*

Title	File
Background Check Certification	<a href="#">1e10b5cf-8b3.pdf</a>

## Difference between Proposal and Work Plan

### *Describe changes from Proposal to Work Plan Stage*

The Minnesota Zoo experienced significant reductions in capacity as a result of the pandemic, but the activities outlined in the workplan are very consistent with the originally submitted proposal. Modest changes to the scope of work include adding the construction of systems to rear newly transformed, juvenile mussels and updating the Show Us Your Mussels Challenge to reflect new distance learning realities. Similarly, the updated budget is consistent with the original submission. Revisions include: personnel costs to reflect updated salary projections and changes in capacity (the Zoo no longer has an Evaluation and Research Specialist); Equipment and Supplies to accommodate the inclusion of systems for rearing newly transformed mussels and inflation; travel associated with the Show Us Your Mussels (SUYM) Challenge; the Professional / Technical Services Contracts in relation to the SUYM Challenge; and the Online Promotion of the SUYM Challenge(Other), as online promotion is no longer possible.

## Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

**Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?**

N/A

**Do you agree travel expenses must follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?**

Yes, I agree to the Commissioner's Plan.

**Does your project have potential for royalties, copyrights, patents, or sale of products and assets?**

No

**Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?**

N/A

**Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?**

N/A

**Does your project include original, hypothesis-driven research?**

Yes

**Does the organization have a fiscal agent for this project?**

No





MINNESOTA ZOO

# EXPANDING RESTORATION AND PROMOTING AWARENESS OF NATIVE MUSSELS



## GOAL

RECOVERED MUSSELS  
CLEANER WATER  
HEALTHY FISH HABITAT  
COMMUNITY ACTION



The DNR transfers small mussels to the Zoo.



The Zoo grows mussels and conducts research to improve growth and survival.

Students learn how to save mussels and habitat.

Larger mussels are returned to the DNR for reintroduction.



Beth Zaiken